A Study of the Impact of Mass Drug Administration (DEC and Albendazole) on the prevalence of Soil-transmitted helminths among Children aged 5 – 14 Years in a rural population

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CERTIFICATE

Certified that this dissertation is the bonafide work of ***Dr. R. UMA MAHESWARI*** *on "***A STUDY OF THE IMPACT OF MASS DRUG ADMINISTRATION (DEC AND ALBENDAZOLE) ON THE PREVALENCE OF SOIL-TRANSMITTED HELMINTHS AMONG CHILDREN AGED 5–14 YEARS IN A RURAL POPULATION***" during her M.D. (Community Medicine) course from May 2006 to March 2009 at the Madras Medical College and Government General Hospital, Chennai.*

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DECLARATION

I solemnly declare that this dissertation entitled "**A STUDY OF THE IMPACT OF MASS DRUG ADMINISTRATION (DEC AND ALBENDAZOLE) ON THE PREVALENCE OF SOIL-TRANSMITTED HELMINTHS AMONG CHILDREN AGED 5–14 YEARS IN A RURAL POPULATION**" was done by me at Institute of Community Medicine, Madras Medical College, during 2006-2009 under the guidance and supervision of **Prof. S. ELANGO**, **M.D**. This dissertation is submitted to the Tamil Nadu Dr.M.G.R. Medical University towards the partial fulfillment of requirements for the award of M.D. Degree in Community Medicine (Branch-XV).

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INTRODUCTION

Soil-transmitted helminths commonly known as intestinal worms are the most common infections world wide affecting the most deprived countries. According to WHO estimate nearly a quarter of the world's population harbour one or more intestinal worms[1].

Recent estimates indicate that approximately 1450 million have roundworm infection, 1300 million have hookworm infection and 1050 million have whip worm infection[1]. The economic burden caused by the hookworm, roundworm and whipworm infection is high and estimated to cost 39.0 million Disability Adjusted Life Years[1].

In 1993, the world bank reported that, within the global burden of disease list , soil-transmitted helminth infections ranked first among children aged 5-14 years ; 16.7 million DALYS were lost , which represents 11.3% of the total burden in this age group. Using mathematical modelling, it has been estimated that 70% of the total burden of diseases due to soil- transmitted helminthic infection can be prevented in high prevalence communities by treating only school – age children[1].

STH infections rarely cause death but chronic STH infections of school -age children resulting from Ascaris, Trichuris and Hookworm negatively affect all aspects of children's health, nutrition, cognitive development, learning and educational access and achievements. Regular de worming can cost effectively

reverse and prevent much of this morbidity. The availability of Diethyl carbamazine (DEC) and Albendazole (ALB), which have antihelmenthic and antifilarial properties opens the possibility of controlling geohelminths in a Filariasis elimination programme because of ancillary benefits of albendozole and the resultant enhanced compliance of the population at risk. These properties opens the possibility of integrating a geohelminth control programme with filariasis elimination programme, where these nematodes occur concurrently[2].

OBJECTIVES

1. To estimate the prevalence of soil-transmitted helminths among children aged 5 – 14 years in rural population.

2. To assess the impact of mass drug administration (DEC and ALB) on the prevalence of above said Soil-transmitted helminths among the same 5 – 14 years children.

3. To find out the possible associated risk factors for the transmission of Soil- transmitted helminths

    a. Socio demographic factors.

    b. Environmental factors

    c. Behavioral factors.

JUSTIFICATION

1. Developing countries are reported to be most affected with intestinal helminthic infection where significant population live in nutritionally compromised states. It is estimated that number of children (< 15 years old) infected with roundworm, hookworm and whip worm in the developing world are 478 millions, 280 millions and 347 millions respectively[3].

2. In India, it was estimated the number of cases in school age due to hookworm, round worm and whipworm were 59 millions, 50 millions and 36 millions and the prevalence were 30%, 25% and 18% respectively[3].

   In Tamilnadu, the prevalence of Ascaris, Trichuris and hookworm were 52.8%, 45.6% and 37.6% respectively in rural school-age children but in Urban population the prevalence of Ascaris and Trichuris were 0.5% and 2.01% respectively. Hookworm was not encountered in urban setting[4].

3. Intestinal helminthic infection have been neglected partly because great emphasis has been placed on survival, especially child survival and less on quality of life, health and productivity of those survive. The subject gains increased importance in school age children as it is

a period of significant growth and development[5] and in growing stage, children are susceptible to ill effects of parasitic infections as their need for nutrients are high[6] and have less developed immune systems. Intestinal helminthic infections in this age group have been linked with significantly reduced growth and an increased risk for protein energy malnutrition including growth stunting, iron deficiency anaemia and reduced cognitive / psychomotor development[6].

4. The severe financial and logistic difficulties in eradicating poverty and instituting the community-wide programs to improve living conditions, Sanitation, water supplies and health education that help to prevent helminthic transmission in the long term poses great problem in most developing countries[7]. Population based chemotherapy with broad spectrum antihelminthic is likely to be the only way to drastically reduce the prevalence and intensity of the soil-transmitted helminths[7].

In light of these facts, this study was planned to ascertain the impact of DEC and ALBENDAZOLE on the prevalence of soil-transmitted helminthic infections which is given under NVBDCP for Filariasis elimination.

REVIEW OF LITERATURE

HISTORICAL ASPECTS

The knowledge of parasitic infection dates back to Egyptian medicine [3000 – 400 BC] and the first written records of parasitic infection came from Ebers Papyrus of 1500 BC discovered at Thebes. Rockfeller sanitary commission was founded in 1909, almost a century ago with aim of eradicating hookworm disease in United States[8].

Norman stoll, estimated the number of helminth infection in humans across the world in1947. The estimated world wide percentages of intestinal parasite remained nearly constant over the past 50 years. The sheer magnitude of these estimates has spurred international interest in these infections and now World Health Organization is scaling up its role in the effort to control disease due to helminth infections[8].

INTESTINAL PARASITES:

The term parasite is derived from the word "Para" means besides and "sitos" means food. A parasite is defined as an "animal or plant, which lives in or upon another organism (host) and draw its nutrients directly from it[9]. Traditionally the term parasite includes, protozoa and helminths[9].

HELMINTHS:

Helminths are multi cellular organisms and the word helminth means 'Worm'[10].There are three groups of medically important helminths → Nematodes, Cestodes and Trematodes. Trematodes include flukes, Cestodes include the beef and pork tapeworm, the largest of the helminths and Nematodes include the roundworm Ascaris lumbricoides, the whipworm Trichuris trichura, and the hookworms Ancylostoma duodenale and Necator americanus, these nematodes are collectively referred to a soil-transmitted helminths.

MODE OF TRANSMISSION OF SOIL-TRANSMITTED HELMINTHS[9, 10].

Soil transmitted helminths are transmitted by eggs excreted in human faeces which contaminate the soil in area that lack adequate sanitation. Humans are infected through.

- Ingestion of infective eggs or Larvae on contaminated food, Water or hands.[Eg Ascaris lumbricoides, Trichuris Trichura, Ancylostoma duodenale].

- Penetration of the skin by infective larvae (Filariform larva) that contaminate the soil. [**Eg. Ancylostoma duodenale.]**

BURDEN OF SOIL-TRANSMITTED HELMINTHIC INFECTIONS:

(a) World:

Globally, intestinal helminthic infections are among the 10 most common infections[11]. Current estimates suggest that more than 1/3rd of the world population are infected with one or more species of parasitic worms. Over one billion of the world's population is estimated to be infected with these parasites more than 300 million suffer from associated severe morbidity and 1, 55, 000 deaths are reported annually[12] .

The global prevalence of the soil-transmitted helminth in high. A recent estimate indicated that approximately 1450 million people have roundworm infection, 1300 million have hookworm infection and 1050 million have whip worm infection. The economic burden caused by hookworm, roundworm and whipworm infection is high. This was recently estimated to cost 39.0 million Disability Adjusted life years (DALYS)[12].

Table 1: Global figures for DALY'S lost as a result of Soil-transmitted helminths

INFECTION	DALYS LOST (Millions)
Hookworms	22.1
Ascariasis	10.5
Trichuriasis	6.4
Total	39.0

Intestinal nematodes in south Asia showed a prevalence of Ascariasis (27%), Trichuriasis (20%) and Hookworm (16%)[13].

India:

Intestinal parasitosis is a major health problem in India more common in rural than Urban Communities. The intestinal infections with parasite like Entamoeba histolytica, Ascaris lumbricoides, Ancylostoma duodenale and Necator americanus are important public health problems in India[14.]. Morbidity due to intestinal parasitic infection is very high and this is attributed to various factors, such as malnutrition, poor personal and community hygiene, improper disposal of sewage and excreta , improper purification of drinking water and close contact with animals[15].

Epidemological studies of hookworm infection in India have shown that both Ancyclostoma duodenale and Necator americanus are endemic. Mixed infection of both parasites has been found in Gangetic West Bengal. Necator americanus are predominant in central and southern India[16].

The overall prevalence rate of various parasitic infections was reported to be 97.4% in rural south Indians in a study done by Gangadeep kang et.al[17].

Soil-transmitted helminthic infection and school-age children:

Of all the persons infected with worms, atleast 50% are school age children. School-age children are important high risk group for intestinal helminthic infections because they are[18].

- In a period of intense physical growth and rapid metabolism resulting in increased nutritional needs.When these needs are not adequately met, individuals are more susceptible to infection.

- In a period of intense learning, helminthic infections have been shown to have a of negative impact on cognitive tasks.

- Continuously exposed to contaminated soil and water and lack of awareness regarding good personal hygiene.

Burden of soil-transmitted helminths among school-age Children :

I. In 1993, the world Bank reported that, within global burden of disease, Soil- transmitted helminths infections ranked first among children aged 5-14 years: 16.7 million DALYS were lost, which represents 11.3% of the total burden in this age group[18]. The number of cases and prevalence of infection for school age children are shown in Table: 2

Table 2 : Number of Cases and Prevalence among school age children

Helminths	*No of Cases(millions)*	*Prevalence(%)*
Roundworm	320	35%
Whipworm	233	25%
Hookworm	239	26%

Source:3

India :

Children in5-14 years age group were 209 million in India. The number of cases of intestinal nematodes by age group in India is given in Table-3.

Table 3 : Estimated number of infections (millions)

Intestinal parasites	*Age*	
	5 – 9 Years	*0-14 years*
Ascariasis	18	17
Trichuriasis	9	9
Hookworm	5	8

Source:13

Umesh Kumar et al[19] reported a prevalence of 72.6% among children upto 12 years attending outpatient clinic in and around Patna with prevalence of Ascaris lumbricoides 22.1%, and Hook worm 7.4%.

Naish S et al[20] reported a prevalence of Ascaris lumbricoides 91%, Trichuris trichura 72% and Hookworm 54% among school children 5-9 yrs from a south Indian fishing village.

A prospective study[21] among 4-15 yrs to children of Kupwara district showed a prevalence of Ascaris lumbricoides 69.23% and Trichuris trichura 30.76%.

A study among 217 primary school Children[22] (7-13 yrs) in Relliveedhi, a slum area in visakhapatnam, Ascaris was the most common infection with a prevalence of 75% followed by Trichuris trichura 66% and hookworm 9%.

Public health importance of soil-transmitted helminthic infection:

Soil-transmitted helminth infections are considered a public health problem of world wide importance for reason of their prevalence, wide spread distribution and effects on health. STH infection risk is reported to be elevated in children compared to other age groups. Hygiene and play habits make children especially vulnerable to STH infection. The school age children are often physically and intellectually Compromised by anemia leading to attention deficits, learning disabilities, school absenteeism and higher dropout rates[23]. The failure to treat school-age children therefore hampers child development, yield a generation of adults disadvantaged by the irreversible sequelae of infection and Compromises the economic development of Communities and nations.

Children infected with helminths[3] are 3.7 times more likely to be stunted and 1.5 times more likely to be under weight. Children who are both infected with Soil-

transmitted helminths and anemia are 5.9 times more likely to be stunted and 4.0 times more likely to be under weight. Above all, it is suggested that helminthic infections play a major role in the pathogenesis of AIDS and Tuberculosis. They apparently make the host more susceptible to infections by HIV and TB, and impair the ability to generate protective immunity against both infections[24].

RISK FACTORS:

Age:

Epidemiological studies of soil-transmitted helminths have shown that the prevalence and intensity of infection are highest among children 4-15 years of age and reaching maximum values at approximately 5-7 years of age[25].

Infection with Trichuris trichura and Ascaris lumbricoides typically reaches maximum intensity at 5-10 years ago after which it declines to a lower level and then persists through out adulthood[26].

Persons in all age groups were studied among rural settlers in Andaman and Nicobar island and changes in the prevalence rate over ages could be observed among them. The prevalence rate of hookworm infection continued beyond school age[27].

Sex:

In a study among rural elementary school children in southern Ethiopia, it was reported more than 75% of the hookworm infected students were males[28].

In a study among school age children in Southern Thailand[29], boys had more intensive hookworms than girls and wore shoes less frequently than girls.

Religion:

In a study about risk factors for geohelminth infection in tea-growing communities of Assam, Hindus were 2.5 times more likely to be infected with Ascaris than individuals of other religions[30].

SOCIOECONOMIC STATUS:

In a study[31] on risk of Ascaris lunbricoides infection among children less than 14 years of age in Brazil, it was found that children from low socioeconomic status were 2.5 times at greater risk of infection when compared to those from middle category.

In a study[32] on the prevalence of intestinal parasites among children aged 8-10 years in Indonesia, infection rate was higher in the children belonging to the low socioeconomic group.

A study [33] on soil-transmitted helminthic infection in an urban locality of Assam reported as the social strata of the students goes up, the infection rate decreased.

A study [34] on geohelminth in preschool children in Sri Lanka, reported that the prevalence tended to increase as the socioeconomic class declined.

MATERNAL EDUCATION:

Studies have shown that lack of mother's education is related to parasitosis. A low proportion of family members were infected with Ascaris lumbricoides in house holds where the respondent had a secondary education than in house holds where the respondents had no formal education [35].

NUMBER OF CHILDREN IN THE HOUSEHOLD:

In a cross sectional study conducted in four rural communities in Honduras on prevalence and incidence of Ascariasis and Trichurasis reported an association between the number of Children living in the house hold and parasitic infections [35].

HOUSING :

Housing status was found to influence the rates of intestinal parasitosis in study in Martinique. The prevalence in rural areas was double of that of urban areas and the reason attributed was poor housing in rural areas [36].

The prevalence of single and multiple helminthic infections was found to be significantly higher in children living in wood or bamboo houses than in those build in concrete blocks in a cross sectional study of Panamian preschool children [37].

OVERCROWDING:

An observational study[38] in rural Nigeria found that high population concentration was one of the factors responsible for the high prevalence of Ascariasis, Trichuriasis and hookworm infection among school children.

In a study[39] on helminthic infection of primary school going children in Manipur, high prevalence was contributed to overcrowding.

OPEN AIR DEFECATION:

Open air defecation results in high degree of soil contamination. Faecal contamination of the peridomestic environment is a serious risk factor in the transmission of helminthic infection.The high prevalence of parasitism among Nepali children can be attributed to unsafe excreta disposal like indiscriminate defecation along with poor personal hygiene[40].

In a study[41] on ecological determinants of intestinal parasitic infection among preschool children in an urban squatter settlement of Egypt, lack of private excreta disposal and the presence of excreta in the yard were associated with increased risk.

USE OF FOOTWEAR :

Practice of not using footwear was playing an important role in the observed high prevalence of hookworm infection among adolescent girls in Tamilnadu[42].

PERSONAL HYGIENE:

In a study[43] on intestinal helminthic infection in Kashmir, the high prevalence of Ascaris among children was related to low standard of personal hygiene.

In a cross sectional study[44] among students in Southwestern Ethiopia, it was reported that there was significant association between status of personal hygiene and rate of infection, where poor personal hygiene favours infection.

FOOD HABITS:

In a study[45] on distribution of intestinal parasitic infection in rural area of West Bengal, high prevalence of infection has been related to increased extra domiciliary food intake habits and lack of food related hygiene.

WATER SOURCE :

In a study done in Srilanka,[46] drinking unpurified water was associated with high prevalence of Ascaris infection.

In a study among children in Rajasthan[47] reported higher prevalence of soil transmitted helminthes infection in rural area than in urban areas and the higher prevalence was due to lack of availability of safe drinking water.

LIVE STOCKS:

In a study among tea-growing community in Northeastern India[48] demonstrates the role of the dog as a significant disseminator and environmental Contaminator of Ascaris lumbricoides in communities where open air defecation by humans occur.

MASS DRUG ADMINISTRATION ON SOIL-TRANSMITTED HELMINTHS :

In an impact[49] study of two rounds of MDA using DEC and ALB on the prevalence of geohelminth, the crude prevalence of hookworm dropped from 25.3% to 5.9% Ascaris lumbricoides (32.3% to 27.6%) and Trichuris trichiura (9.4% to 8.9%).

In double blind placebo controlled study[50] in Haitan children, the combination DEC and ALB reduced the prevalence of Ascaris, Trichuris and Hookworm more than placebo or DEC alone.

In a study conducted from Leogane, Haiti[51] , 9 months after the second MDA with DEC and ALB, the overall prevalence of Ascaris, Trichuris and hookworm infection reduced to 14.1%, 14.6% and 2.0% from baseline prevalence of 20.9%, 30.4% and11.2% respectively.

In a longitudinal community trial[52] among school children aged 9-10 years in Villupuram , the combined mass drug treatment [DEC and ALB] produced a higher reduction in the prevalence (51-77%) when compared with 12-15% reduction in the prevalence on DEC alone mass treatment. The effect of two-drug therapy after two annual treatments was relatively long lasting as shown by reduction in prevalence indicating that the reinfection rates were relatively lower in this approach than single drug therapy.

METHODOLOGY

STUDY DESIGN:

An interventional study design – "Before and after" comparison study without control.

STUDY AREA:

The study district Trichirapalli(Trichi) was chosen randomly from 13 districts covered for mass drug administration in Tamilnadu. One PHC [ANBIL] in Trichi health unit district was chosen at random. This area is about 35 kms away in north from Trichi.

The PHC ANBIL has 5 health subcentres with total population of 30106 of which **14942** were male and **15154** were females. One sub centre[Mangammalpuram] was selected randomly from the five subcenters. Primary Health Centre showing study area is enclosed in Annexure No.1

STUDY POPULATION :

All the Children aged between 5-14 years of the selected subcentre (Mangammalpuram).

INCLUSION CRITERIA :

1. Children between the age group of 5-14 years of both sexes and permanent residents of the village.

2. Parents/ guardian of 5-14 years children who gave informed consent.

EXCLUSION CRITERIA:

1. Children between 5-14 years of both Sexes who are temporary residents of the village.

2. Children between 5–14 Yrs age group who had taken antihelminthic within last 30 days.

3. Parents/guardian of 5-14 years children who had not given informed consent.

STUDY PERIOD:

The data was collected over a period of 2 months extending from Dec 2007 to Jan 2008.

SAMPLE SIZE:

The prevalence of Ascaris, Trichuris and hookworm in a rural setting in Tamilnadu was reported to be 52.8% , 45.6 and 37.6% respectively by Maria Carol et al[4].

By taking this as index prevalence, sample size was calculated using the formula.

$$n = \frac{(1.96)^2}{d^2} pq$$

Where 1.96 is the confidence level

p = Prevalence

q = 100-p

d = Precision Value

For Roundworm:

p = 53% (52.8%)

q = 100-p = 48%

d = (15% of P) =7.8

$$n = \frac{1.96 \times 1.96 \times 52 \times 48}{7.8 \times 7.8} = 157.6 = 158$$

For Trichuris:

p = 45% (45.6%)

q = (100- p) = 55%

d = 6.75 (15% of p)

$$n = \frac{1.96 \times 1.96 \times 45 \times 55}{6.75 \times 6.75} = 208.6 - 209$$

For Hookworm:

p = 37% (37.6%)

q = (100-p) = 63%

d = 5.55 (15% of P)

$$n = \frac{1.96 \times 1.96 \times 37 \times 63}{5.55 \times 5.55} = 290.71 = 291$$

From above calculation, the largest sample size among the three 291was taken. Considering non response in providing stool samples as 10% of 291 that was 29 ; the sample size thus calculated was 320.

SAMPLING METHOD:

The children in the age group 5-14 were listed from the village wise enumerated data for mass drug administration of DEC and Albendazole of the selected sub centre and were serially numbered. Using this as sampling frame, children were selected by simple random sampling method. The 320 random numbers were generated from the Table of Random Numbers.

DEVELOPMENT OF QUESTIONNAIRE:

The questionnaire for this study was developed based on the information obtained from various studies[6, 20, 29, 30] related to this topic, modified with the help of the guide. It was pre tested by a pilot study among 20 children in Kosavanpalayam village in Thirunindravoor Primary Health Centre area and based on the observation, necessary modifications were made and the final questionnaire was prepared.

The final questionnaire used for the main study included identification number for the child, semi- structured questions for collecting information from the parents / guardians of the children regarding socio – demographic profile, housing, water, sanitation and personal hygiene of the child. The questionnaire used for the study in closed in the Annexure No.2.

DATA COLLECTION:

Permission to conduct the study was obtained from Director of Public Health and Preventive medicine, Chennai and also from Deputy Director, Trichy, Health Unit District.

The purpose of the study was explained to all parents / guardians and informed oral consent was obtained. The questionnaire was administered to the parents / guardians of the selected children by house-to-house visits 2-3 weeks prior to MDA through interview by a single interviewer as almost half of the mothers were illiterate. The child was clinically examined for cleanliness of finger nails. If the selected child house found locked, the child in next/adjacent house was included.

The parents / guardians of the children were then given numbered sterile plastic container containing 10 -15 ml of 10% formol saline with well fitting lids along with a spoon for collection of stool sample of the children and they were instructed to collect fresh stool sample of the child and were explained about the methods of stool collection. Single stool sample from each child was collected the next morning by the VHN and if the mother had not collected the Stool specimen for first time, revisits were made on two consecutive days and they were again explained of the importance of stool examination by the investigator. The stool samples collected were transported to Microbiology laboratory of K.A.P.V.MEDICAL COLLEGE, TRICHI for laboratory examination.

The stools were examined for the presence of eggs of soil-transmitted helminths using saturated sodium chloride floatation method, the useful and inexpensive method of concentrating soil-transmitted helminthic eggs especially in field surveys[53]. The investigator underwent training in the Microbiology Department of K.A.P.V Medical College, Trichy on the technique of stool examination. The Microbiologist of the above said college cross verified all the positive samples and 10% of negative stool samples reported. The procedure for stool examination is furnished in Annexure No.3.

Mass drug administration with DEC and ALBENDAZOLE was given on 27.12.2007. Again one stool sample was collected between 3 – 4 wks after mass drug administration [DEC and ALBENDAZOLE] from the same children by repeating the above said procedure. Logistically, it is not possible to ascertain that have really taken their drugs. So an 'intention to treat' analysis was done.

ANALYSIS:

Data entry was made in excel software in codes and analysis was done with SPSS 10 version. Prevalence was expressed in percentage and associations between certain variables and soil transmitted helminthic infestation were calculated with odds ratio and tested for significance using chi square test and the impact of drug on soil-transmitted helminths were tested using McNemar's test

DEFINITION OF TERMS USED

Prevalence: Number of egg-positive cases in population. [Stool sample showing even a single egg of soil- transmitted helminths was considered as positive]

Soil -transmitted helminths:

Also known as Geohelminths. Soil-transmitted helminths *Ascaris lumbricoides*, *Trichuris trichiura* and the hookworms (Ancylostoma duodenale and Necator americanus).In all of these worms, eggs are passed in faeces and undergo maturation in soil.

MATERNAL EDUCATION:

Maternal Education Status was grouped into two categories as illiterates and literates for analysis. As per census of India "any person who is able to read and write with understanding in any language "is considered as literate.

Housing[54] :

Katcha House : House made from mud, thatch or Low quality materials

Semi Pucca : When a house made using partly low quality and partly high quality material

Pucca : A house made with high quality materials through out including roof , walls and floor

Standard of Living Index:

Standard of living index was calculated as per the procedure followed in NFHS – II survey[55]. Details are furnished in the Annexure No: 4

Over Crowding:

Presence of overcrowding was expressed based on the number of persons per room as per the accepted standards[56].

One room	-	Two persons
Two room	-	Three persons
Three room	-	Five persons
Four room	-	Seven persons
Five or More rooms	-	Ten persons (Additional Two persons for each further rooms)

A baby under 12 months is not counted; children between 1–10 years counted as half a unit.

Cure Rate:

The difference in the prevalence rates for each geohelminth between pre- and post-treatment values was expressed as percentage of pre-treatment value.

RESULTS AND DISCUSSION

A population based study of the impact of Mass drug administration (DEC and Albendazole) on the prevalence of soil-transmitted helminths among 5-14 years was carried out in Mangammalpuram subcentre of Anbil Primary Health Centre area. The subcentre had 4 villages with a total population of 4326 with a target population of 691 of which 337 were male children and 354 were female children. Prevalence of soil-transmitted helminths was estimated 2-3 weeks prior and 3-4 weeks after administration of drug. The area is along the side of river Coreloon and did not have any under ground sewerage and public latrine facility. Using Simple random sampling, 320 children in the age group 5-14 years were selected.

From the 320 children, Stool sample was collected from 315 children. Stool samples from 5 children could not be collected inspite of three visits before MDA. After MDA, only 305 children gave stool samples and 10 samples from children those who found negative for STH infestation in stool sample prior to MDA could not be collected due to non availability of children.

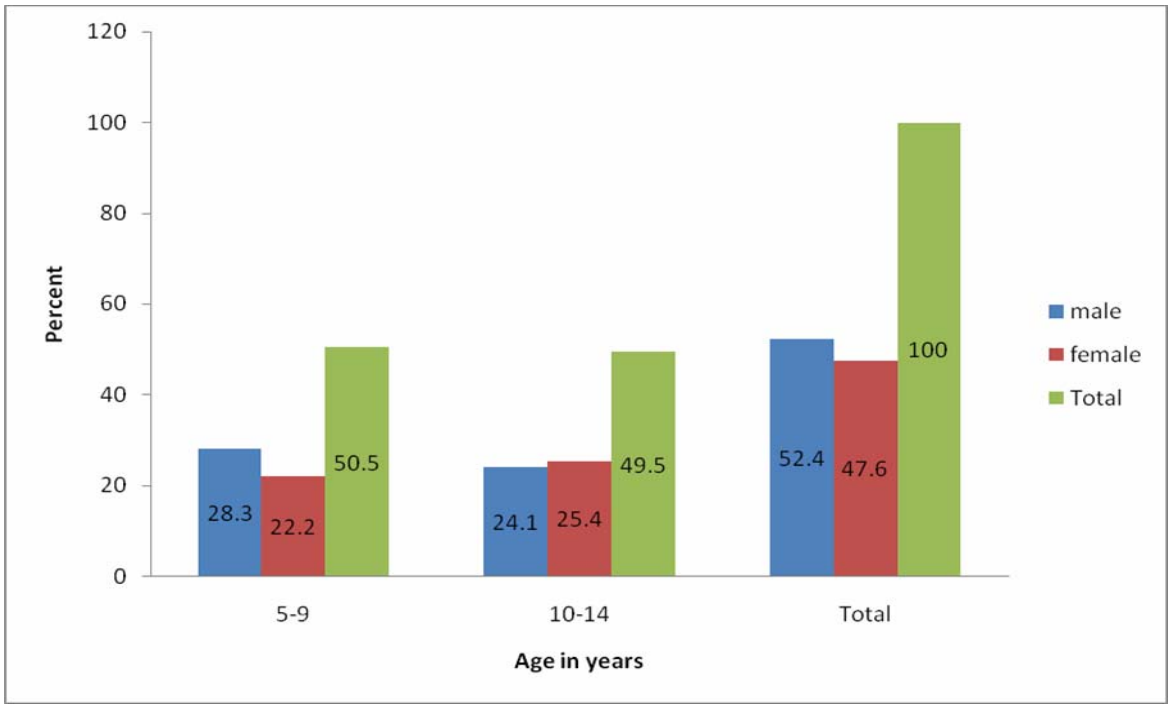
AGE AND SEX DISTRIBUTION OF CHILDREN:

Of the 315 children, 165 (52.4%) were male children and 150(47.6%) were female children, and 159 (50.5%) were in the age group 5-9 years and 156 (49.5%) were in the age group 10-14 Years. Details are shown in Table:1 and Fig:1.

Age (years)	*Sex*		*Total*
	Male(%)	*Female(%)*	
5-9	89(28.3)	70(22.2)	159(50.5%)
10-14	76 (24.1)	80 (25.4)	156 (49.5%)
Total	165(52.4%)	150 (47.6)	315(100)

Table 1: Distribution of children by Age and Sex [n= 315]

Fig -1 Distribution of children by Age and Sex



SOCIO-DEMOGRAPHIC CHARACTERISTICS OF CHILDREN:

Table 2: Socio-demographic characteristics of children(n=315)

Details	*Number*	*Percentage*
Number of Family members		
>4	161	51.1
≤4	154	48.9
Standard of living		
Low	192	61.0
Medium	105	33.3
High	18	5.7
Maternal Education		
Illiterate	156	49.5
Primary school	53	16.8
Middle school	75	23.8
High School	23	7.3
Higher School	5	1.5
Graduate	3	0.95
Post Graduate	0	–

The average size of the family was 4.79 and 154 (48.9%) children belonged to family having four and less than four family members and 161 (51.1%) children

belonged to family having more than four family members. Based on standard of living index, 192 children (61.0%) belonged to low standard of living.

Majority of the respondents for the study were mothers (95.2%) and large proportion of them 181(57.4%) were employed a manual labourers followed by 126(40%) were house wives. Out of 315 mothers, 156 mothers (49.5%) were illiterate followed by 53(16.8%) mothers who had completed primary school and 75 (23.8%) mothers completed middle school.

ENVIRONMENTAL FACTORS:

Table 3: Particulars of Housing (n=315)

Details	*Number*	*Percentage*
Type of house		
Katcha	131	41.6
Semipucca	131	41.6
Pucca	53	16.8
Over crowding*		
Yes	258	81.9
No	57	18.1

** As per number of persons per living room*

Most of the children 131(41.6%) were living in Katcha houses and 131 children (41.6%) were living in Semipucca houses and only 53 (16.8%) were living in pucca houses.

Based on number of persons per living room, 258 (81.9%) were found to be living in over crowded houses.

DRINKING WATER:

Table 4: Particulars of Drinking water (n=315).

Details	*Number*	*Percentage*
Source		
Public	301	95.6
Private	14	4.4
Type		
Public taps	269	85.4
Hand pumps	33	10.1
Own well	7	2.2
Own bore well	7	2.2
Method of purification		
Boiling	56	17.8
Filteration	11	3.4
Both	56	17.8
Nil	192	61.0

Considering the drinking water supply, majority of the houses 301 (95.6%) had public source of water supply and the remaining 14 (4.4%) houses had private source of water supply. A large proportion of houses 269 (85.4%) collected drinking water through public taps. Regarding water purification method, majority of the families 192 (61.0%) did not practice any method of water purification.

FOOD HABITS AND FOOD HYGIENE OF CHILDREN:

Table:5 Particulars of food habits and food hygiene of children(n=315)

Details	*Number of children with Hookworm*	*Percentage*
Eating raw foods(Vegetables/Fruits):		
Yes	212	67.3
No	103	32.7
Washing raw foods before eating:*		
Yes	54	25.4
No	158	74.6
Eating other than home made foods:		
Yes	269	85.4
No	46	14.6

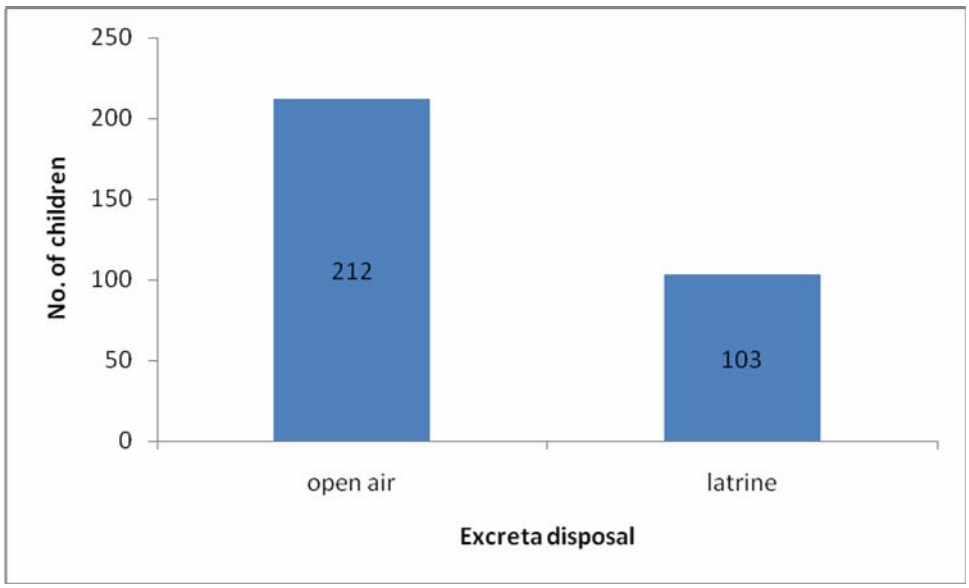
***n=212, others n=315**

Majority of the children 212 (67.3%) had the habit of eating raw foods (Vegetables/Fruits) and most of these children 158(50.1%) did not wash them before eating. Habit of eating other than home made foods was seen in majority 269 (85.4%) of the children, and was most commonly from street vendors.

EXCRETA DISPOSAL:

Majority of the children 212 (67.3%) went for open-air defecation and only 103 (32.7%) had sanitary latrine, out of which 21 (6.6%) children had sanitary latrine exclusively for the family and 82 (26%) shared the facility with other families. Details are shown in Fig 2.

Fig 2: Excreta disposal

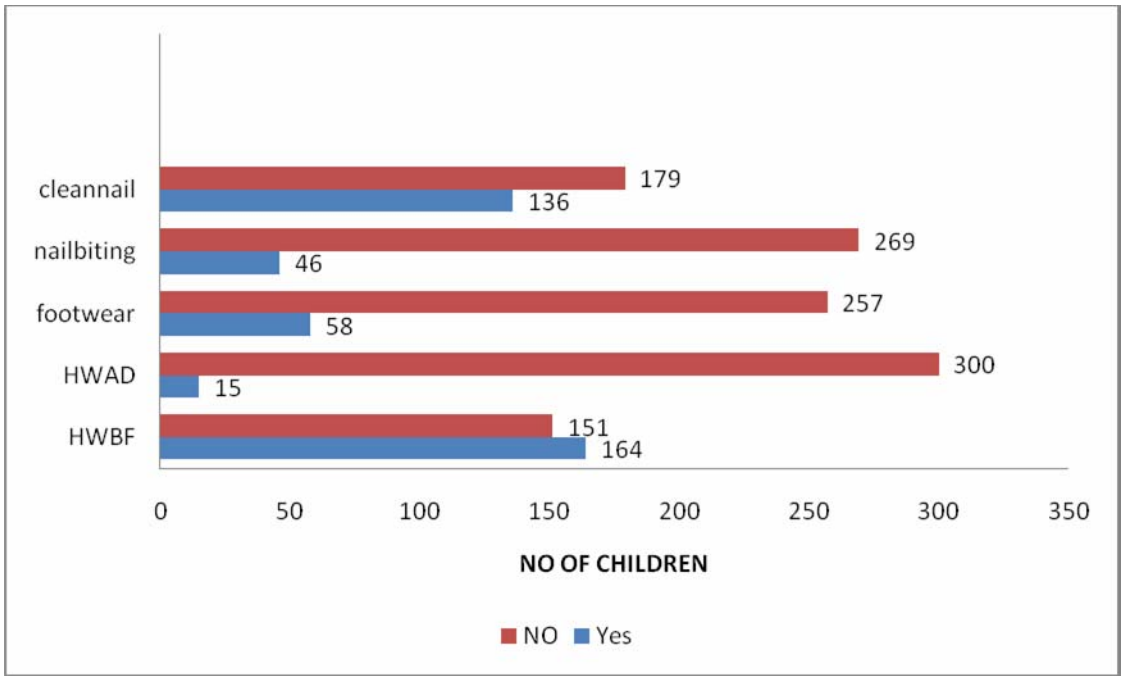


PERSONAL HYGIENE OF CHILDREN:

It was found that majority of the children 151 (47.9%) did not wash their hands before eating and 300 (95.2%) did not wash their hands with soap after defecation. It was observed that 136 (43.2%) of the children had their finger nails(clean and trimmed) and 46 (14.6%) had habit of nail biting.

Regarding use of footwear, 257(81.6%) children did not use their footwear. Details are shown in Fig 3.

FIG 3: Personal hygiene of children



HWBF –Hand washing before food

HWAD –H and washing with soap and water after defecation

PREVALENCE OF SOIL-TRANSMITTED HELMINTHIC INFESTATION:

Stool Samples from 315 children were examined 2-3weeks prior to MDA. Of the 315 children, the over all prevalence of soil- transmitted helminths was found to be 42.2% (95%CI=36.6-47.7). Hookworm was found to be commonest among 91 children with a prevalence of (28.9%) followed by roundworm among 42 children with a prevalence of 13.3%. Not even a single stool sample with Trichuris was found. Details are shown in Table 6.

Table 6 : Prevalence of soil-transmitted helminthic infestation(n=315)

Soil –transmitted Helminthic infestation	*Number of children*	*Prevalence (%)*
Hookworm	91	28.9%
Roundworm	42	13.3%

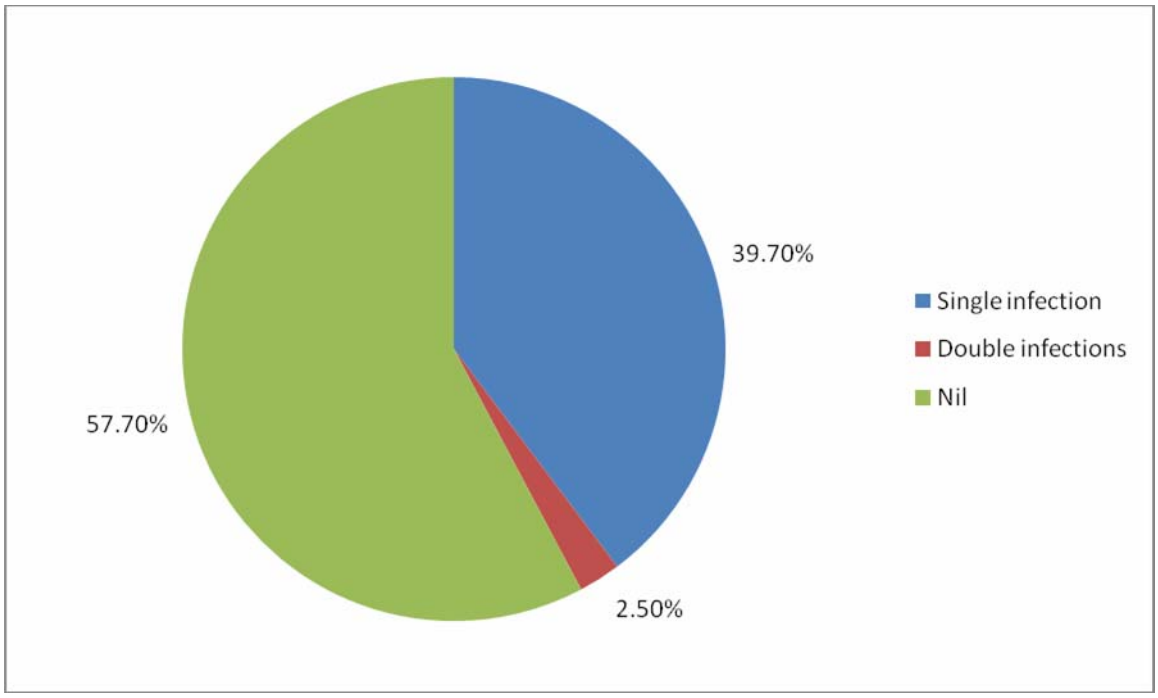
Similar report of Trichuris prevalence was reported in a study conducted in Lucknow, Uttarpradesh[57]. Interestingly when other studies done in Chennai[4], Villupuram[2], and Lucknow[57] showed be a higher prevalence of Ascaris, the present study revealed higher prevalence of hookworm (28.9%) than roundworm (13.3%). This can be attributed to nature of the soil and prevailing moist warm and shady environment[10] since this area is along the side of River Coreloon.

Among the study children, 125 had single soil- transmitted helminthic infestation and 8 had double infestations. Details given in Table 7 and Fig 4.

Table 7: Pattern of soil –transmitted helminthic infestation

Soil –transmitted Helminthic infestation	*Number of children*	*Prevalence (%)*
Single infection	125	39.7
Double infections	8	2.5

Fig 4 –Distribution of Soil-transmitted helminths among children(5-14yrs)



AGE AND SEX-WISE PREVALENCE OF SOIL-TRANSMITTED HELMINTHS:

Table 8: Prevalence of hookworm by age and sex(n=315)

Group	*Number of children with hookworm*		*Total*	χ^2	*p value*
	Yes	*No*			
Age in Years					
5-9	48	111	159	0.26	>0.05
10-14	43	113	156		
Total	91	224	315		
Sex					
Male	44	121	165	0.8	>0.05
Female	47	103	150		
Total	91	224	315		

Among children in age group 5-9 years the prevalence of hookworm infestation was 30.2% (95% CI= 23.07-37.3) and among 10-14years it was 27.6% (95% CI=20.6-34.6) and this difference was found to be statistically insignificant (p>0.05).

The prevalence of hookworm among male children was 26.7% (95% CI=20.1-33.3) and female children was 31.3% (95% CI=23.9-38.7) and this difference was found to be statistically insignificant (p>0.05).

Table 9: Prevalence of round worm by age and sex

Group	***Number of Children with roundworm***		***Total***	***χ^2***	***p value***
	Yes	*No*			
Age in years					
5-9	25	134	159	1.58	>0.05
10-14	17	139	156		
Total	42	273	315		
Sex					
Male	19	146	165	0.99	>0.05
Female	23	127	150		
Total	42	273	315		

Among children in age group 5-9 years the prevalence of roundworm infestation was 15.7% (95%CI=10-21.4) and among 10-14years it was 10.9(95% CI=6-15.8) and this difference was found to be statistically insignificant(p>0.05)

The prevalence of roundworm among male children was 11.5% (95% CI=6.6-16.4) and female children was 15.3% (95% CI=9.6-21.0) and this difference was found to be statistically insignificant (p>0.05).

Epidemiological studies of soil-transmitted helminths have shown that the prevalence and intensity of infection are highest among children 4-15 years of age and reaching maximum values at approximately 5-7 years of age[25]

Study done in Thiruvananthapuram[6] showed high prevalence among female children compared to male children.

IMPACT OF DIETHYLCARBAMAZINE AND ALBENDAZOLE ON SOIL-TRANSMITTED HELMINTHS:

Prior to MDA, stool samples from 315 children were collected but 3-4weeks after MDA only 305 samples were collected. So for analysis, only 305 samples were included.

Table 10: Prevalence of hookworm before and after MDA(n=305)

Hookworm Before MDA	***After MDA***		***Total***
	Yes	***No***	
Yes	12	79	91
No	0	214	214
Total	12	293	305

χ^2_{Mc} =77 d.f=1 p<0.001

The Prevalence of hookworm prior and 3-4 Weeks after mass drug administration was 29.8% (91/305) and 3.9% (12/305) respectively. This difference in prevalence of hookworm prior and after MDA was statistically significant ($p<0.001$) and produced a cure rate of 86.9%.

Table 11: Prevalence of roundworm before and after MDA(n=305)

Roundworm Before MDA	***After MDA***		***Total***
	Yes	***No***	
Yes	2	40	42
No	0	263	263
Total	2	303	305

χ^2_{Mc} =38 d.f=1 $p<0.001$

The Prevalence of roundworm prior and 3-4 weeks after mass drug administration was 13.7%(42/305) and 0.6%(2/305) respectively and this difference in prevalence of roundworm prior and after MDA was statistically significant ($p<0.001$) and produced a cure rate of 95.6%.

In a study done in Villupuram[2] 3 weeks after MDA among 1-15 years age group combination therapy produced a cure rate of 74.3% for geohelminth which was higher than corresponding rates (30.4%) observed with DEC alone. The odds of cure with combination therapy were significantly higher for roundworm (5.3 times) and hookworm (3.5 times), than odds of cure with DEC alone.

In a study[58] on sustainability of soil-transmitted helminth control following a single-dose co-administration of albendazole and diethylcarbamazine among 9 and 10 years in Villupuram, the combination therapy showed long-term efficacy against STHs and the magnitude of control remained at a moderate and significant level for 11 months after MDA compared with the moderate gains of diethylcarbamazine alone.

In community based follow-up study[59] from Villupuram among 9-10 years after 3 round MDA, the reduction in STH prevalence was lower in the DEC alone arm(6.5% $p>0.05$) than in the DEC and ALB arm(70.9%;$p<0.001$) and also showed higher and sustained benefits with regard to STH infections for the two drug arm over the DEC alone arm.

This study shows that combination therapy given once in a year was effective in reducing the prevalence of soil- transmitted helminths in the school children and concludes that increased emphasis on mass drug administration for STH reduction was appropriate and it also benefits the community by reducing environmental contamination and there by reduces transmission of infection and decreased infection in untreated persons in the community.

ASSOCIATION BETWEEN CERTAIN FACTORS AND SOIL-TRANSMITTED HELMINTHIC INFESTATION:

MATERNAL EDUCATION AND SOIL-TRANSMITTED HELMINTHS:

Table 12: Maternal education and soil-transmitted helminthic infestation(n=315)

Hookworm							
Maternal Education	***Number of children***		***Total***	***OR***	***95%CI of OR***	χ^2	***p value***
	Yes	***No***					
Illiterate	61	95	156	**2.7**	**1.6-4.7**	**15.6**	**<0.01**
Literate	30	129	159				
Total	91	224	315				
Roundworm							
Illiterate	32	124	156	**3.8**	**1.7-8.7**	**13.8**	**<0.01**
Literate	10	149	159				
Total	42	273	315				

When children were assessed for the presence of geohelminths based on maternal educational status, it was found that children of illiterate mothers were at 2.7 times higher risk for hookworm infestation and 3.8 times higher risk for roundworm infestation than the children of literate mothers and it was found to be statistically significant($p<0.01$)

Similarly in a study done among children from fishing families in a south Indian village, children with low levels of education of the mother had the highest intensity of infection[20]

This reveals that maternal education plays an important role in the decline of soil-transmitted helminths among children, which can be attributed to better knowledge of literate mothers on mode of transmission and importance of cleanliness.

STANDARD OF LIVING AND SOIL-TRANSMITTED HELMINTHS:

Table 13: Standard of living index and soil-transmitted helminthic infestation (n=315)

Hookworm*							
SLI	***Number of Children***		***Total***	***OR***	***95%CI of OR***	***χ^2***	***p value***
	Yes	***No***					
Low	65	127	192	2.5	0.6-11.5	2.2	>0.05
Medium	23	82	105	1.4	0.3-6.7	0.2	>0.05
High	3	15	18	1.0			
Total	91	224	315				
Roundworm**							
Low	33	159	192	3.5	0.4-73.5	1.6	>0.05
Medium	8	97	105	1.4	0.1-31.7	0.1	>0.05
High	1	17	18	1.0			
Total	42	273	315				

*** χ^2 for linear trend=5.86, p<0.05**

**** χ^2 for linear trend=5.86, p<0.05**

Children from low and medium of standard of living were at higher risk of both hookworm and roundworm infestation when comparing to children from high standard of living but not statistically significant($p>0.05$).This decrease in risk of infection with increase in standard of living index was found to be statistically significant.

A study on soil –transmitted helminthic infection is an Urban Locality of Assam[33] reported as the social strata of the students goes up, the infection rate decreased.

This higher prevalence of hookworm and roundworm infestation among children from low standard of living can be attributed to the poor state of physical environment in which they live.

ENVIRONMENTAL FACTORS AND SOIL-TRANSMITTED HELMINTHS:

Table 14: Environmental factors and hookworm infestation (n=315)

Environmental factors	*Number of children with hookworm*		*Total*	*OR*	*95%CI of OR*	χ^2	*p value*
	Yes	*No*					
Housing*							
Katcha	42	89	131	1.6	0.7-3.6	1.6	>0.05
Semipucca	37	94	131	1.3	0.6-3.4	0.6	>0.05
Pucca	12	41	53	1.0			
Total	91	224	315				
Overcrowding							
Yes	80	178	258	1.8	0.8-4.0	3.12	>0.05
No	11	46	57				
Total	91	224	315				
Water source							
Public	88	213	301	1.5	0.3-7.0	0.4	>0.05
Private	3	11	14				
Total	91	224	315				
Water Purification							
No	65	127	192	**1.9**	**1.1-3.3**	**5.88**	**<0.05**
Yes	26	97	123				
Total	91	224	315				

Excreta disposal							
Open air defecation	73	139	212	**2.5**	**1.3-4.6**	**9.7**	**<0.01**
Latrine	18	85	103				
Total	91	224	315				
Vector Nuisance							
Yes	45	89	134	1.4	0.8-2.5	2.5	>0.05
No	46	135	181				
Total	91	224	315				

* χ^2 for linear trend=1.6, p>0.05

Children living in katcha and semi pucca houses were at higher risk of hookworm than children living in pucca houses but not statistically significant(p>0.05).

Children living in overcrowded houses and with the presence of vector nuisance were at higher risk of hookworm infestation but not statistically significant (p>0.05).

Children who were in the habit of drinking unpurified water and going for open-air defecation were at significantly higher risk of hookworm infestation (p<0.05).

In a study done in Nigeria coastal communities[60], highest prevalence of hookworm was through water borne transmission (60.9%) than soil transmission (52.9%).

Similarly lack of sanitary latrine and children defeating in the site other than sanitary latrine were associated with higher prevalence of soil-transmitted helminths in a cross sectional study done in rural Honduran Communities[35]. This may be due to the fact that open air defecation contaminates the soil, which increase the risk of geohelminthic infestation.

Table 15: Environmental factors and round worm infestation(n=315)

Environmental factors	*Number of Children with roundworm*		*Total*	*OR*	*95% CI of OR*	χ^2	*p value*
	Yes	*No*					
Housing*							
Katcha	22	109	131	2.4	0.7-8.9	2.6	>0.05
Semipucca	16	115	131	1.7	0.5-6.3	0.8	>0.05
Pucca	4	49	53	1.0			
Total	42	273	315				
Overcrowding							
Yes	35	223	258	1.1	0.4-2.9	0.07	>0.05
No	7	50	57				
Total	42	273	315				
Drinking Water Source							
Public	41	260	301	2.0	0.2-43.0	0.49	>0.05
Private	1	13	14				
Total	42	273	315				
Water Purification							
No	33	159	192	**2.6**	**1.2-6.1**	**6.3**	**<0.05**
Yes	9	114	123				
Total	42	273	315				
Excreta Disposal							
Open air defecation	32	180	212	1.6	0.7-3.7	1.7	>0.05
Latrine	10	93	103				
Total	42	273	315				
Vector Nuisance							
Yes	22	112	134	1.5	0.7-3.1	1.9	>0.05
No	20	161	181				
Total	42	273	315				

* χ^2 for linear trend=3.02, p>0.05

Children living in katcha and semi pucca houses were at higher risk of roundworm than children living in pucca houses but statistically insignificant ($p>0.05$). A study among 2-12 years children in Upper Egypt[61] reported marginal association of type of house (mud vs cement) with intestinal helminthic infection.

Children living in overcrowded houses, going for open air defecation and with the presence of vector nuisance were at higher risk of roundworm infestation but not statistically significant ($p>0.05$).

Children who were in the habit of drinking unpurified water at significantly higher risk of roundworm infestation than the children who drank purified water (OR=2.6 $p<0.05$). It is a well known fact that use of inadequately treated water is a common cause of intestinal worm infection and appropriate water purification (boiling) prevents intestinal worm infestation.

FOOD HABITS AND SOIL-TRANSMITTED HELMINTHS:

Table 16: Food habits and hookworm infestation (n=315)

Details	*Number of Children*		*Total*	*OR*	*95% CI of OR*	χ^2	*P value*
	Yes	*No*					
Eating raw foods (vegetables/ fruits)							
Yes	73	139	212	2.4	1.3-4.6	9.7	<0.01
No	18	85	103				
Total	91	224	315				
Washing raw foods before eating*							
No	56	102	158	1.1	0.5-2.4	0.2	>0.05
Yes	17	37	54				
Total	73	139	212				
Eating other than home foods							
Yes	80	189	269	1.3	0.6-2.9	0.6	>0.05
No	11	35	46				
Total	91	224	315				

*n=212 others n=315

Children eating raw foods (vegetables /fruits)were 2.4 times higher risk of hookworm than children who do not eat uncooked foods and it was found to be statistically significant ($p<0.01$).This can be attributed to Children's habit of picking and eating fruits (locally available fruits like Jujubes, Jamun) from soil contaminated with human faeces.

Children not washing raw foods before eating and eating other than home made foods were at higher risk of hookworm infestation but not statistically significant (p>0.05).

Table 17: Food habits and roundworm infestation(n=315)

Details	*Number of Children with roundworm*		*Total*	*OR*	*95% CI of OR*	χ^2	*p value*
	Yes	*No*					
Eating raw foods (vegetables /fruits)							
Yes	32	180	212	1.6	0.7-3.7	1.74	>0.05
No	10	93	103				
Total	42	273	315				
Washing raw foods before eating*							
No	25	133	158	1.2	0.4-3.4	0.2	>0.05
Yes	7	47	54				
Total	32	180	212				
Eating other than home foods							
Yes	40	229	269	3.8	0.8-23.8	3.76	>0.05
No	2	44	46				
Total	42	273	315				

*n=212 others n=315

Children eating raw vegetables/ fruits, not washing it before eating and eating other than home made foods were at higher risk of roundworm infestation, but not statistically significant.

In a study[6] among primary school children in Thiruvananthapuram, roundworm infection among children was associated to consumption of raw, uncooked vegetables.

FOOTWEAR USE AND SOIL-TRANSMITTED HELMINTHS:

Table 18: Use of footwear and hookworm infestation(n=315)

Use of footwear	*Number of children with hookworm*		*Total*	*OR*	*95% of OR*	χ^2	*p value*
	Yes	**No**					
No	83	174	257	2.9	1.9-7.1	7.88	<0.01
Yes	8	50	58				
Total	91	224	315				

Children who do not use footwear had higher risk for hook worm infestation (32.3%) compared to children who use footwear(13.8%) which was found to be statistically significant (OR=2.9, $p<0.01$).

Similarly in a study among children in Southern Ethiopia[28], high risk of hookworm infections was found among children who did not use footwear (OR=1.96).

A study in Alabama[62] reported highest prevalence of hookworm (99%) among school Children who commonly did not wear shoes and strongly advocated foot wear use as protection from hookworm infection.

Use of footwear to protect feet from contact with contaminated soil has been recognized as an important preventive measure.

PERSONAL HYGIENE AND SOIL-TRANSMITTED HELMINTHS:

Table 19: Personal hygiene and hookworm infestation

Details	*Number of Children with hookworm*		*Total*	*OR*	*95%CI of OR*	χ^2	*p value*
	Yes	**No**					
Hand washing before food							
No	52	99	151	**1.6**	**1.0-2.8**	**4.3**	**<0.05**
Yes	39	125	164				
Total	91	224	315				
Hand washing after defecation							
With water	89	211	300	**2.7**	**0.5-17.9**	**1.86**	**>0.05**
With Soap and water	2	13	15				
Total	91	224	315				
Finger Nails(clean and trimmed)							
No	61	118	179	**1.8**	**1.06-3.1**	**5.43**	**<0.05**
Yes	30	106	136				
Total	91	224	315				
Nail biting							
Yes	15	31	46	**1.23**	**0.5-2.5**	**0.36**	**>0.05**
No	76	193	269				
Total	91	224	315				

Children who do not have the habit of washing hands before food and children with unclean and untrimmed nails were at higher risk of hookworm infestation and statistically significant ($p<0.05$).

Children who have the habit of washing hands after defecation with water alone and nail biting were at higher risk of hookworm infestation , but not statistically significant (p>0.05).

This can be attributed to the children's habit of playing in soil and favours transmission of hookworm by penetrating the skin and through ingestion of food by dirty fingers.

Table 20: Personal hygiene and roundworm infestation(n=315)

Details	*Number of Children with roundworm*		*Total*	*OR*	*95%CIof OR*	χ^2	*p value*
	Yes	*No*					
Hand washing Before food							
No	31	120	151	**3.5**	**1.6-7.9**	**12.9**	**<0.01**
Yes	11	153	164				
Total	42	273	315				
Hand washing after defecation							
With Water	41	259	300	2.2	0.2-46.3	0.6	>0.05
With soap and Water	1	14	15				
Total	42	273	315				
Finger Nails(clean and trimmed)							
No	30	149	179	**2.0**	**0.9-4.5**	**4.2**	**<0.05**
Yes	12	124	136				
Total	42	273	315				
Nail biting							
Yes	10	36	46	2.0	0.8-4.8	3.2	>0.05
No	32	237	269				
Total	42	273	315				

Children who do not have the habit of washing hands before food and children with unclean and untrimmed nails were at higher risk of roundworm infestation and statistically significant.

Children who have the habit of washing hands after defecation with water alone and nail biting were at higher risk of roundworm infestation, but not statistically significant (OR=2.2 $p>0.05$).

Children with unclean and untrimmed nails were at 2 times higher risk of roundworm infestation than children with clean and trimmed nails and it was statistically significant (OR=2.0, $p<0.05$).

In a study among tribal population in Kerala[11], the practice of hand wash was found to be statistically significant showing that habit of proper hand wash considerably reduces the risk of helminthic infestation.

This can be attributed to the children's habit of playing in soil and ingestion of food by dirty fingers.

SUMMARY

A Population based study was carried out in ANBIL Primary Health center of Trichirapalli District to estimate the prevalence of Soil-transmitted helminths and risk factors favouring transmission among 5-14 years and also the impact of Mass drug administration of DEC and Albendazole on the above said prevalence of soil-transmitted helminths. Stool Samples from 315 children were examined 2-3 weeks before MDA and stool sample from 305 children were examined 3-4 weeks after MDA by using Saturated Saline floatation technique.

The prevalence of hookworm and roundworm was 28.9% and 13.3% respectively. Not even a single case of Trichuris Trichura was reported. Risk factors such as open air defecation, non-use of footwear, drinking unpurified water, not washing hands before food, eating raw vegetables / fruits, unclean and untrimmed nails, maternal education and standard of living index were having significant association in the transmission of geohelminths.

Combination therapy with DEC and Albendazole produced a significant reduction in the prevalence of hookworm form base line value of 28.9% to 3.9% after 3-4 weeks of Mass drug administration where as in roundworm from baseline of 13.3.% to 0.6% after 3-4 weeks of drug administration.

RECOMMENDATIONS

Measures to reduce the prevalence of soil-transmitted helminths in the school-age children are

1. Health education should be targeted to mothers regarding the modes of transmission of geohelminths and importance of personal hygiene of children.

2. Health education for school children in School Health Programme should emphasis on simple personal hygienic measures such as hand washing before food and after defecation with soap and water, safe drinking water, wearing footwear and washing raw food thoroughly before eating.

3. Government should construct and maintain public convenience and also educate communities to change their behaviour to use sanitary latrines and promote construction of sanitary latrine for their own purpose.

4. Daily inspection and recording of children personal cleanliness by school teachers should be made strict.

5. Government can supply footwear free of cost to school children.

6. Regular deworming of School Children atleast twice a year by organising deworming days in schools by giving minimal training to teachers in administrating drug will be the most effective way of treating these high risk groups. Non-school going children can be targeted by Village Health Nurse.

LIMITATIONS

1. This study was done in one subcentre area. Ideally it should be evenly done in all subcentre of Anbil PHC.

2. Being a single investigator the intensity of infection was not assessed though it was necessary for assessing the impact of drug.

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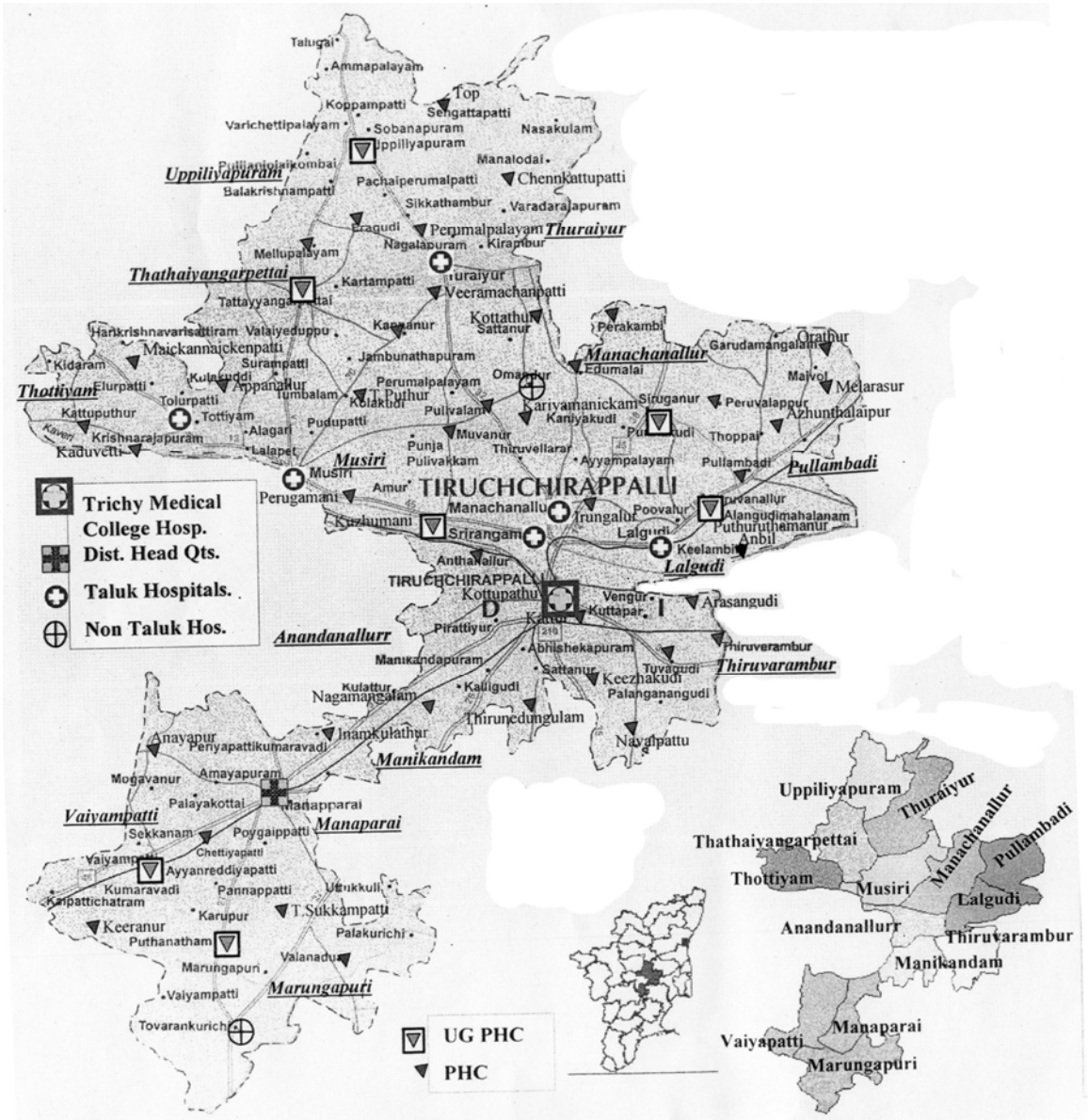
ANNEXURE - 1

TRICHIRAPALLI DISTRICT



ANNEXURE - 2

Village :

I.D No. :

Informant :

A. GENERAL INFORMATION

1. Name :

2. Age [in Yrs] :

3. Sex : 1. Male 2. Female :

4. Address :

5. Details :

S. No	*Name of the family members*	*Relation to child*	*Age*	*Sex*	*Education*	*Occupation*	*Income*
1.							
2.							
3.							
4.							
5.							
6.							
7.							

6. Standard of living index :
   1. Low 2. Medium 3. High ( )

B. ENVIRONMENTAL FACTORS:

7. Type of house :

   1. Katcha 2. Semi pucca 3. Pucca ( )

8. Number of living rooms : (excluding bath, Kitchen) ( )

9. Over crowding
   1. Yes 2. No ( )

10. Drinking water supply :

   - Source 1. Public 2. Private 3. Both ( )

   - Type 1. Well 2. Bore well

     3. Taps 4. Hand pumps ( )

     5.Others

   - Purification Method practiced at home:

   1.Boiling 2.Filteration ( )

   3.Both 4.Nil

11. Sanitary facility available at family level:

   l. Open – air defecation 2. Public convenience

   3. Private ( )

12. If private:
   1. Exclusive for the family 2. Shared ( )

13. Whether child uses latrine:

   1. Yes 2.No ( )

14. Presence of following nuisance at home :

   1. Yes (Specify) 2.No ( )

C. PARTICULARS RELATED TO FOOD HABITS OF THE CHILD:

15. Habit of eating raw foods (Vegetables/ fruits):
    1.Yes 2. No ( )

16. If Yes, Habit of washing it before eating:
    1.Yes 2. No ( )

17. Habit of eating other than home cooked foods:
    1.Yes 2. No ( )

18. If, Yes,
    Place:1.Hotel 2.Street vendors 3.Others(specify) ( )

D. PARTICULARS RELATED TO PERSONAL HYGIENE OF THE CHILD:

19. Hand washing before food :
    1.Washing with soap and water 2.Washing with water
    3. Nil ( )

20. Hand washing after defecation
    1. Washing with soap and water
    2. Washing with water ( )

21. Finger Nails (clean and trimmed) – Observation
    1. Yes 2. No. ( )

22. Nail biting
    1. Yes 2. No ( )

23. Use of footwear outside house :
    1. Yes 2. No ( )

E. STOOL EXAMINATION :

S.No.	*Soil- transmitted helminths*	*Results*	
		PRE - MDA	*POST - MDA*
1.	Hookworm		
2.	Roundworm		
3.	Whipworm		

ANNEXURE - 3

STOOL EXAMINATION ;

Microscopic examination of the stool samples was done by Saturated Sodium Chloride floatation technique.

PREPARATION OF SATURATED SODIUM CHLORIDE SOLUTION :

Stir Sodium Chloride (eg. Table Salt) into hot clean distilled water until no more can be dissolved. Add a few more grams of salt so that a layer of the un dissolved salt remains in the bottom of the stock container. Mix well and leave un dissolved salt to sediment. When cooled, filter some of the Solution and by using hydrometer, check for the specific gravity is 1.200.

10% FORMOL SALINE PREPARATION :

100ml of concentrated formaldehyde solution (37 – 42%) added to 900ml of normal saline.

SATURATED SODIUM CHLORIDE FLOATATION TECHNIQUE :

1. The identification number of the child was written on a flat bottomed vial and glass slide.

2. Fill the vial about one quarter full with saturated Sodium Chloride solution.

3. Add an estimated 1 gm of faeces (or 2ml of a fluid specimen). Using a rod or stick emulsify the specimen in the solution.

4. Fill the vial up to the brim with saturated sodium chloride solution.

5. Place a glass slide on the top of the vial leave undisturbed for 30 – 45 minutes to give time for the eggs to float.

6. After 30 – 45 minutes, carefully the glass slide was lifted and turned up and cover slip was placed.

EXAMINATION:

1. The slide were examined microscopically under low power objective (10x) after ensuring adequate illumination.

2. The entire cover slip area was examined starting from the top left hand corner and moving the slide systematically backwards and forwards, also up and down.

When egg was seen, examination was done under high power objective 40X) after ensuring adequate illumination to observe the detailed morphology.

ANNEXURE – 4

STANDARD OF LIVING INDEX

Sl.No	*Item*	*Status*	*score*
1	House type	Pucca	4
		Semi Pucca	2
		Kutcha	0
2	Toilet Facility	Own Flush Toilet	4
		Public or Shared Flush Toilet or Own Pit Toilet	2
		Shared or Public Pit Toilet	1
		No Facility	0
3	Source of Lighting	Electricity	2
		Kerosene, Gas or Oil	1
		No Source	0
4	Main Fuel for Cooking	Electricity, L.P.G, or Biogas	2
		Coal, Charcoal or Kerosene	1
		Other Fuel	0
5	Source of Drinking Water	Pipe, Hand Pump, Well in the Residence/Yard/Plot	2
		Public Hand Pump or Well	1
		Other Source	0
6	Separate Room for Cooking	Yes	1
		No	0
7	Ownership of	Yes	1

	House	No	0
8	Ownership of Agriculture Land	5 acres or more	4
		2-4.9 acres	3
		< 1 or acreage not known	2
		No Agriculture Land	0
9	Ownership of Irrigated Land	Own at least some Irrigated Land	2
		No Irrigated Land	0
10	Ownership of live stock	Owns Live Stock	2
		No Live Stock	0
11	Ownership of Durable Goods	Car / Tractor	4 For Each Item
		Moped / Scooter /Motor Cycle / Telephone / Refrigerator / Colour T.V	3 For Each Item
		Bicycle / Electric Fan / Radio / Sewing Machine/ Black & White T.V / Water Pump / Bullock Cart / Thresher	2 For Each Item
		Mattress / Pressure Cooker / Chair / Cot / Bed / Table / Watch	1 For Each Item

Standard of Living Index

Index Score Range	**Standard of Living Index**
0 – 14	Low
15 – 24	Medium
25- 67	High

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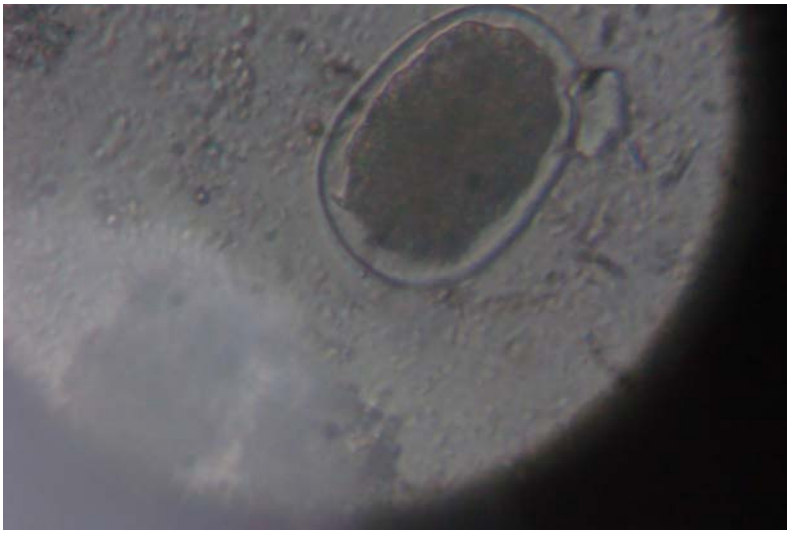
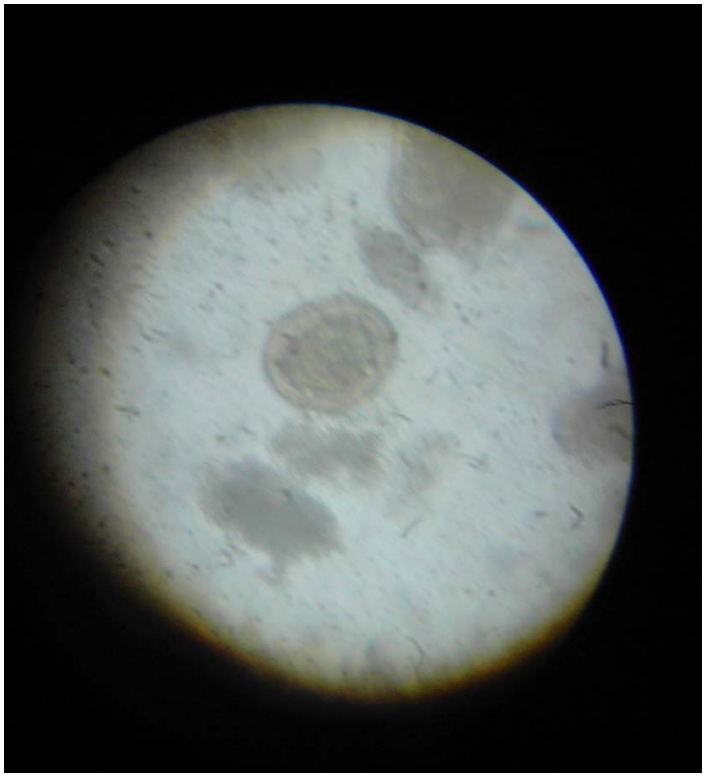
ABBREVIATIONS USED

STH	- Soil-transmitted helminths
NVBDCP	- National Vector Borne Disease Control Programme
DEC	- Diethylcarbamazine
ALB	- Albendazole
MDA	- Mass Drug Administration
PHC	- Primary Health Centre
DALY	- Disability Adjusted Life Years
VHN	- Village Health Nurse

MICROSCOPIC VIEW (40X) OF HOOKWORM EGG



MICROSCOPIC VIEW (40X) OF ROUNDWORM EGG



INSTITUTIONAL ETHICAL COMMITTEE

GOVERNMENT GENERAL HOSPITAL & MADRAS MEDICAL COLLEGE,
CHENNAI-600 003.

13

Telephone: 044-2530 5000
Fax : 044 – 25305115

K.Dis.No.43781/P & D3/Ethics/Dean/GGH/08 Dated: 24/11/2008

Title of the work : "A study of the impact of mass drug administration (DEC & Albendazole) on prevalence of soil transmitted helminths among 5–14 yrs in rural population"

Principal Investigator : Dr. Uma Maheswari, M.D.C.M., Final year

Department : Institute of community Medicine, MMC, Ch.3.

The request for an approval from the Institutional Ethical Committee (IEC) was considered on the IEC meeting held on 25.11.2005 at 2 P.M in Government General Hospital, Deans, Chamber, Chennai-3.

The members of the Committee, the Secretary and the Chairman are pleased to approve the proposed work mentioned above, submitted by the principal investigator.

The principal investigator and their term are directed to adhere the guidelines given below:

1. You should get detailed informed consent from the patients/participants and maintain confidentiality.
2. You should carry out the work without detrimental to regular activities as well as without extra expenditure to the Institution or Government.
3. You should inform the IEC in case of any change of study procedure, site and investigation or guide.
4. You should not deviate form the area of the work for which I applied for ethical clearance.
5. You should inform the IEC immediately, in case of any adverse events or serious adverse reactions.
6. You should abide to the rules and regulations of the institution(s)
7. You should complete the work within the specific period and if any extension of time is required, you should apply for permission again and do the work.
8. You should submit the summary of the work to the ethical committee on completion of the work.
9. You should not claim funds from the Institution while doing the work or on completion.
10. You should understand that the members of IEC have the right to monitor the work with prior intimation.

SECRETARY
IEC, GGH,CHENNAI

CHAIRMAN
IEC, GGH,CHENNAI

12

DEAN
GGH &MMC, CHENNAI

விவரபட்டியல்

கிராமம் :

அடையாள எண் :

தகவல் கொடுப்பவர் :

I. பொது விவரம்

1) குழந்தையின் பெயர் :

2) வயது :

3) பாலினம் : 1) ஆண் 2) பெண்

4) முகவரி :

5) குடும்ப விவரம் :

வரிசை எண்	*குடும்ப நபர்களின் பெயர்*	*குழந்தைக்கு உறவு முறை*	*வயது*	*பாலினம்*	*கல்வி*	*தொழில்*	*மாத வருமானம்*

6) வாழ்க்கை நிலை குறியீடு:

1) கீழ்நிலை 2) நடுநிலை 3) மேல்நிலை

II. சுற்றுப்புற சூழ்நிலை

7) வீட்டின் தன்மை

1) கூரை வீடு 2) ஓட்டு வீடு 3) தள வீடு

8) அறைகளின் எண்ணிக்கை (சமையல் மற்றும் குளியலறை தவிர)

9) a) *குடிநீர் வழங்கப்படும் முறை:*

1) பஞ்சாயத்து வழியாக 2) சொந்தமாக 3) இரண்டும்

வகை: 1) கிணறு 2) ஆழ்குழாய் கிணறு 3) குடிநீர் குழாய்

4) கையடி பம்பு 5) மற்றவை

b) *வீடுகளில் குடிநீரை சுத்தகரிக்கப்படும் முறை:*

1) கொதிக்க வைத்தல் 2) வடிகட்டுதல் 3) இரண்டும் 4) இல்லை

10) கழிப்பிட வசதி

1) திறந்த வெளி 2) பொதுக்கழிப்பிடம் 3) தனியார் கழிப்பிடம்

11) தனியார் கழிப்பிடம் எனில்

1) ஒரு குடும்பத்திற்கு மட்டும்

2) ஒன்றுக்கு மேற்பட்ட குடும்பத்திற்கு

12) கழிப்பிடத்தை குழந்தை பயன்படுத்துமா?

1) ஆம் 2) இல்லை

13) பூச்சித் தொல்லை இருக்கிறதா?

1) ஆம் 2) இல்லை

III. குழந்தையின் உணவுப் பழக்கம்

14) பச்சைக் காய்கறிகள், பழங்கள் சாப்பிடும் பழக்கம் உண்டா?

1) ஆம் 2) இல்லை

15) ஆம், எனில் சாப்பிடும் முன் கழுவி சாப்பிடும் பழக்கம் உண்டா?

1) ஆம் 2) இல்லை

16) வெளியில் உணவு சாப்பிடும் பழக்கம் உண்டா?

1) ஆம் 2) இல்லை

17) ஆம் எனில், 1) உணவகம் 2) தெருவில் விற்பவை 3) மற்றவை

IV. குழந்தையின் தன் சுத்தம்

18) சாப்பிடும் முன் கை கழுவும் முறை

1) சோப்புடன் கைகழுவுதல் 2) தண்ணீர் மட்டும்

2) இல்லை

19) மலம் கழித்தபின் கை கழுவும் பழக்கம்

1) சோப்புடன் கை கழுவுதல்

2) தண்ணீர் மட்டும்

20) கவனித்தல்: நகம் சுத்தம்

1) ஆம் 2) இல்லை

21) நகம் கடிக்கும் பழக்கம் உண்டா?

1) ஆம் 2) இல்லை

22) வெளியில் செல்லும்பொழுது காலணி அணியும் பழக்கம் உண்டா?

1) ஆம் 2) இல்லை